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Internal interfaces over a step change in wall roughness[1] R. JASON HEARST, Univ of Southampton, RONALD E. HANSON, Applied Fluid Dynamics Inc., BHARATHRAM GANAPATHISUBRAMANI, Univ of Southampton — When flow encounters a step change in wall roughness, an internal boundary layer is formed near the wall. This internal layer grows with streamwise position and eventually dominates the entire boundary layer, returning it to equilibrium with the new boundary condition. It is well established that a canonical turbulent boundary layer is populated by patches of high and low velocity, referred to as uniform momentum zones (UMZs). The UMZs are separated by shear events. In this study, the characteristics of UMZs are examined as the flow transitions from one wall condition to another. Planar particle image velocimetry measurements were performed over both a rough-to-smooth (R→S) and a smooth-to-rough (S→R) step change in wall roughness. For the flow over a R→S change, the maximum wall normal position of the high momentum UMZs that populate the outer region of the boundary layer moves outward towards the free-stream, while the low momentum UMZs that are situated near the wall move closer to the wall. The talk will discuss the implication of these results as well as the results for the flow over a S→R step change in wall roughness.

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